US006953003B1

(12) **United States Patent**
Mulhern

(10) **Patent No.: US 6,953,003 B1**
(45) **Date of Patent: Oct. 11, 2005**

(54) **WATERCRAFT LANDING CRADLE**

(75) Inventor: **Francis M. Mulhern**, Riverton, NJ (US)

(73) Assignee: **The United States of America as represented by the Secretary of the Navy**, Washington, DC (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **10/738,075**

(22) Filed: **Dec. 18, 2003**

(51) **Int. Cl.**[7] **B63B 35/40**
(52) **U.S. Cl.** **114/259**; 114/365
(58) **Field of Search** 114/44, 45, 258–262, 114/343, 344, 364, 365, 366, 368; 405/1–7; 280/414.1; 414/137.7

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,410,243	A *	3/1922	Brown et al.	405/3
2,151,394	A *	3/1939	Rogers	405/3
2,325,994	A *	8/1943	Zoll	405/3
2,390,300	A *	12/1945	Harris	114/45
3,437,066	A *	4/1969	Schwendtner	114/260
3,539,065	A *	11/1970	Brownell	414/458
3,721,096	A *	3/1973	Deckert et al.	405/7
4,227,828	A *	10/1980	Ivanov et al.	405/1
4,243,344	A *	1/1981	Gardon	405/2
4,915,577	A *	4/1990	Fraser	414/476
5,234,285	A *	8/1993	Cameron	405/2
5,485,798	A *	1/1996	Samoian et al.	114/44
5,544,606	A *	8/1996	Schmidt, Jr.	114/48
5,613,462	A *	3/1997	Schwartz	114/362
6,047,659	A *	4/2000	Schmidt, Jr.	114/369
6,055,924	A *	5/2000	Marshall et al.	114/242
RE37,061	E *	2/2001	Stokoe et al.	405/1
6,502,525	B2 *	1/2003	Burke	114/259
6,591,770	B1 *	7/2003	Blackmore	114/48
6,782,842	B1 *	8/2004	Alvord	114/369
6,786,170	B2 *	9/2004	Trowbridge	114/259

FOREIGN PATENT DOCUMENTS

DE	4109578	A1 *	9/1992	B63C 3/06
EP	196433	A1 *	10/1986	B63C 5/04
FR	2620405	A1 *	3/1989	B62D 63/08
JP	58211992	A *	12/1983	B63C 5/04
JP	58211993	A *	12/1983	B63C 5/04
JP	60056696	A *	4/1985	B63C 13/00
JP	63137096	A *	6/1988	B63C 1/02
JP	01078999	A *	3/1989	B63C 1/02
JP	01085896	A *	3/1989	B63C 1/02
JP	03235794	A *	10/1991	B63C 1/02
JP	03253490	A *	11/1991	B63C 15/00

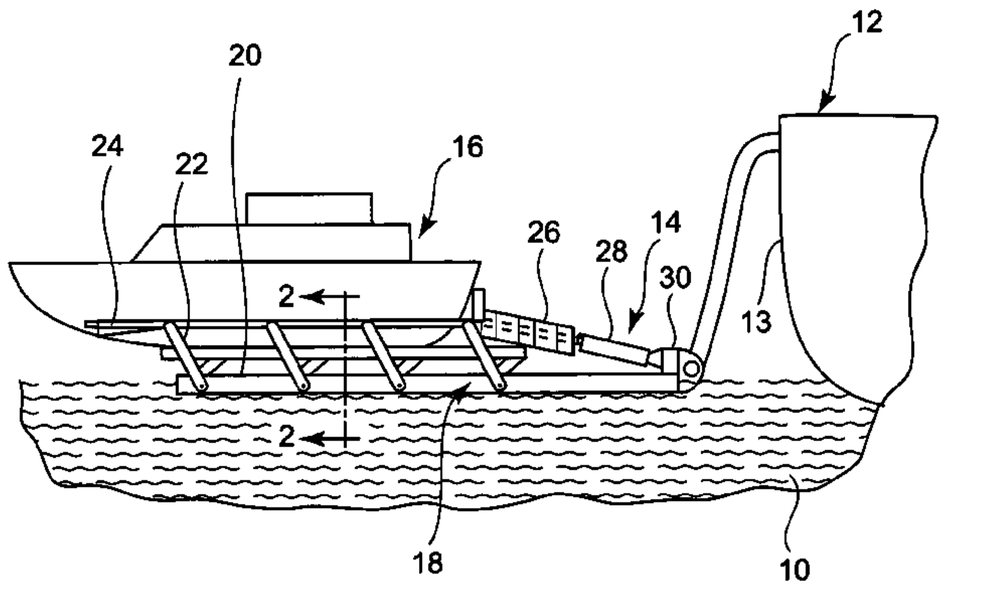
* cited by examiner

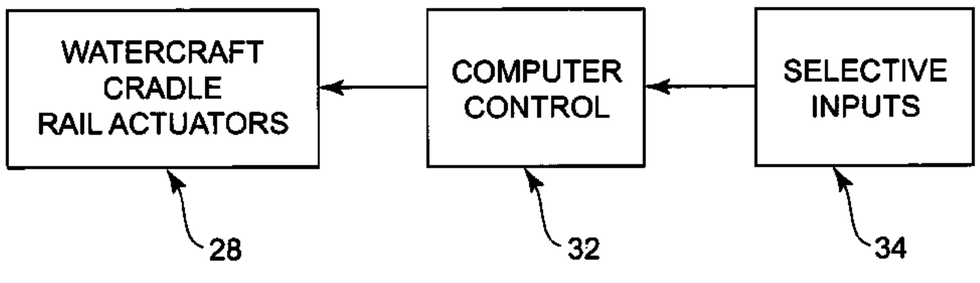
Primary Examiner—S. Joseph Morano
Assistant Examiner—Ajay Vasudeva
(74) *Attorney, Agent, or Firm*—Jacob Shuster

(57) **ABSTRACT**

A parallelgram arrangement of linkages interconnect a stern ramp frame with a plurality of parallel rails vertically adjusted to positions above the ramp frame by actuators for reception and maintenance of a watercraft thereon with minimized vibration, further reduced by shock-absorbing springs positioned in engagement with the rails and the rail actuators. Rail positioning adjustment by the actuators is effected under computer control to match different hull shapes of the watercraft that are curved or v-shaped and therefore non-flat.

2 Claims, 3 Drawing Sheets





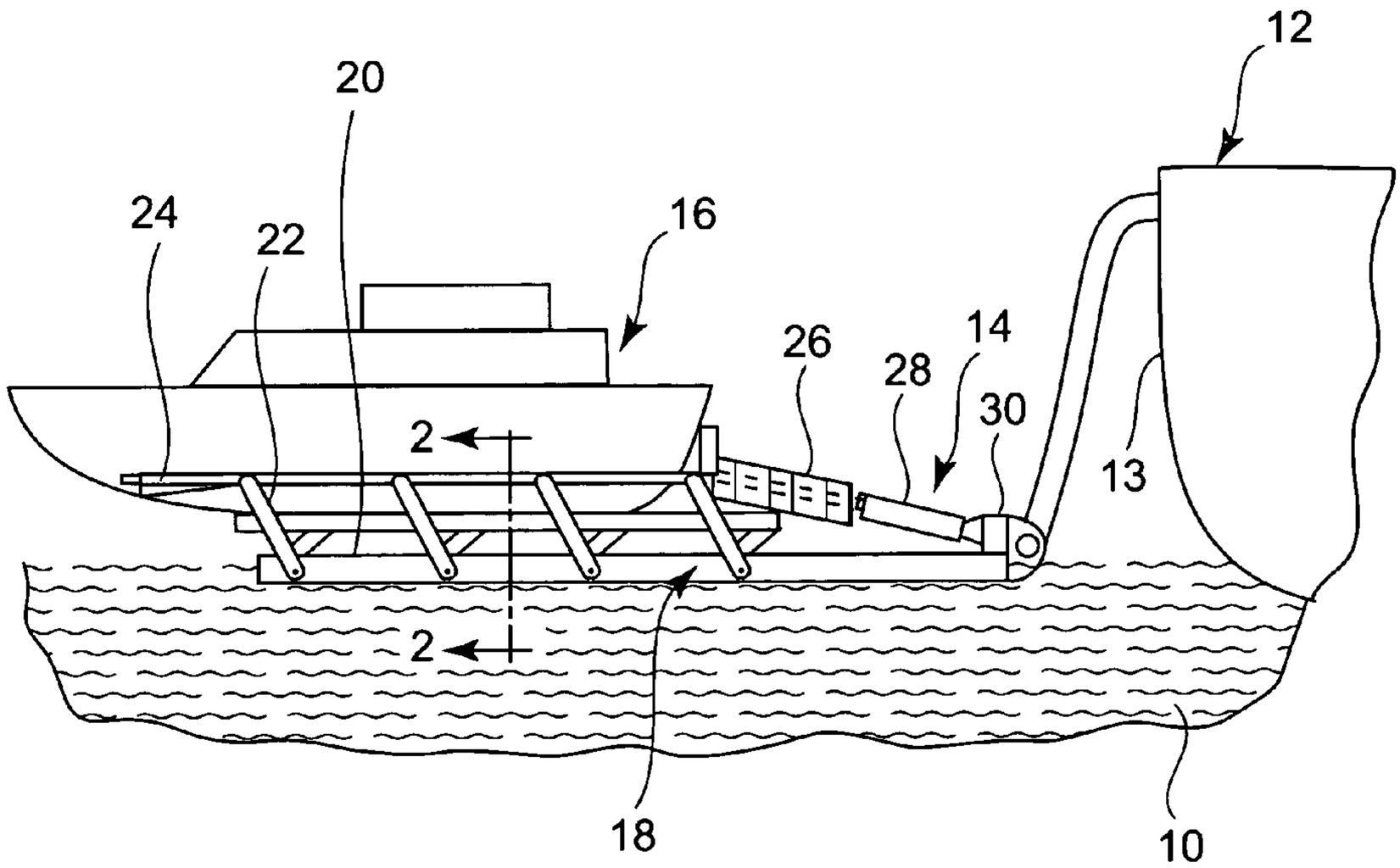


FIG. 1

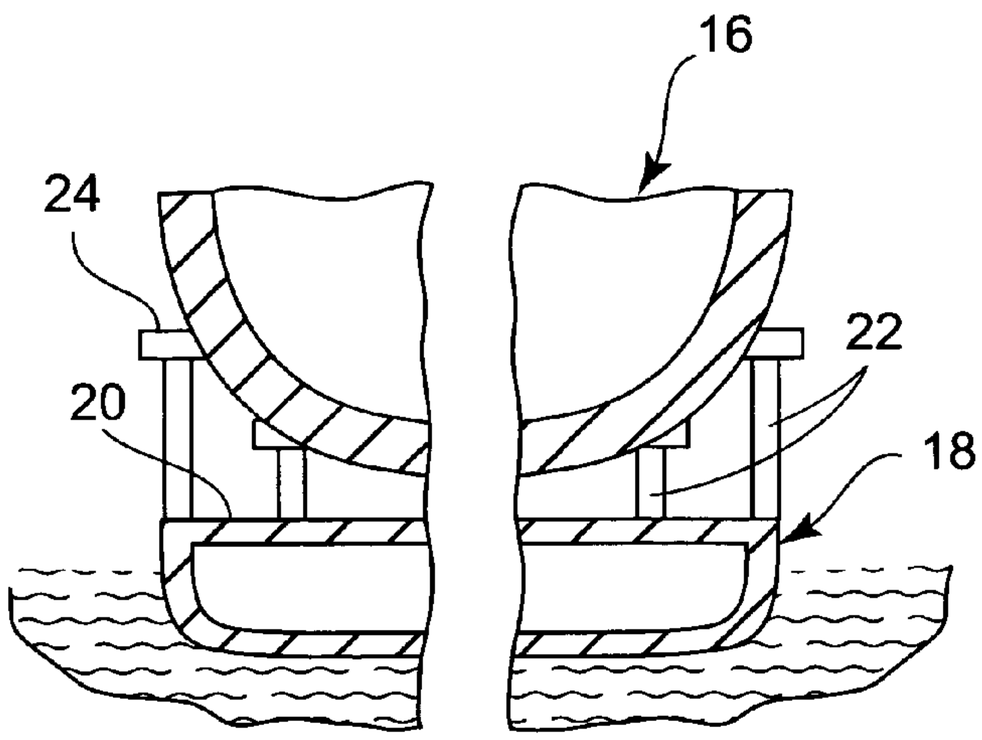


FIG. 2

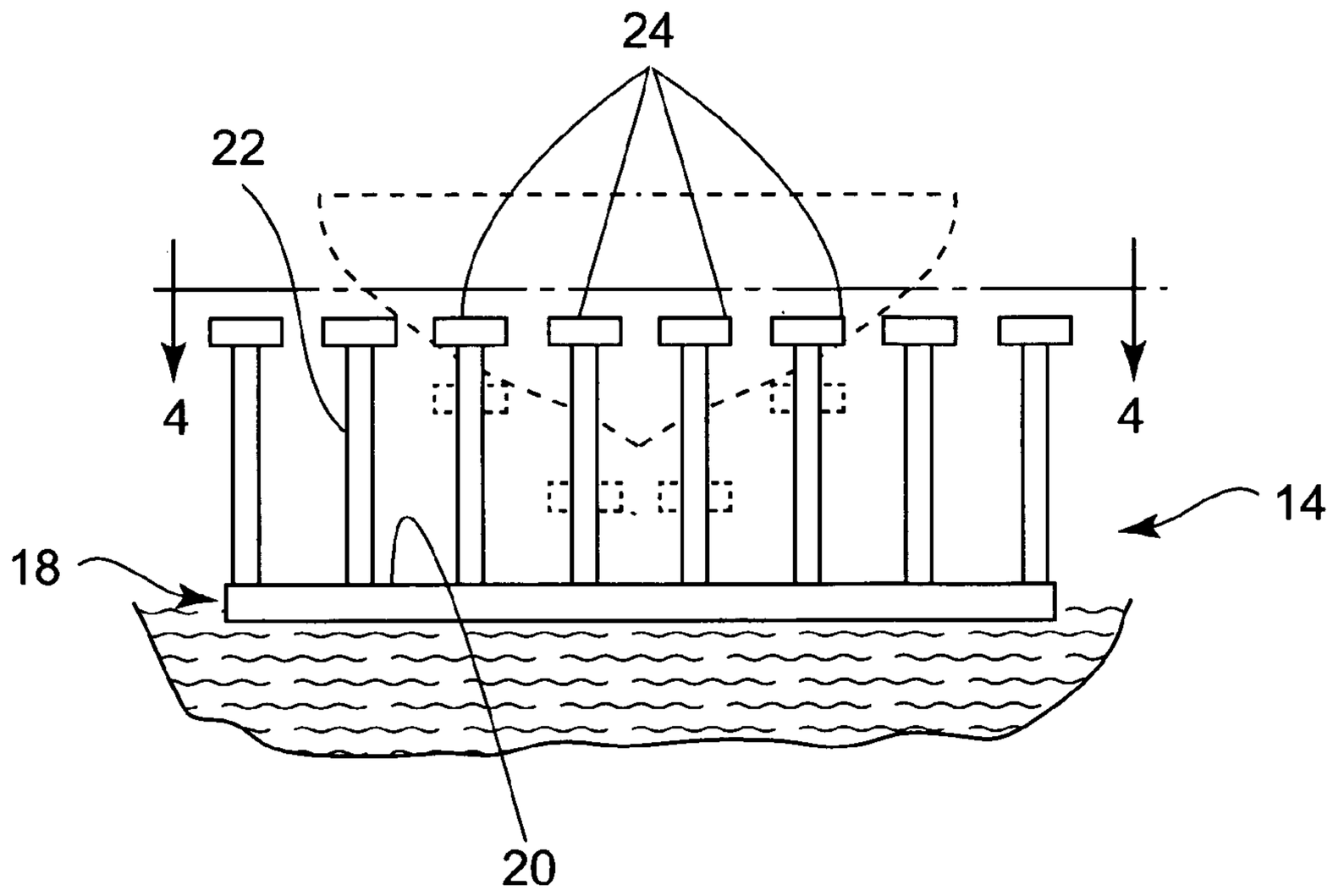


FIG. 3

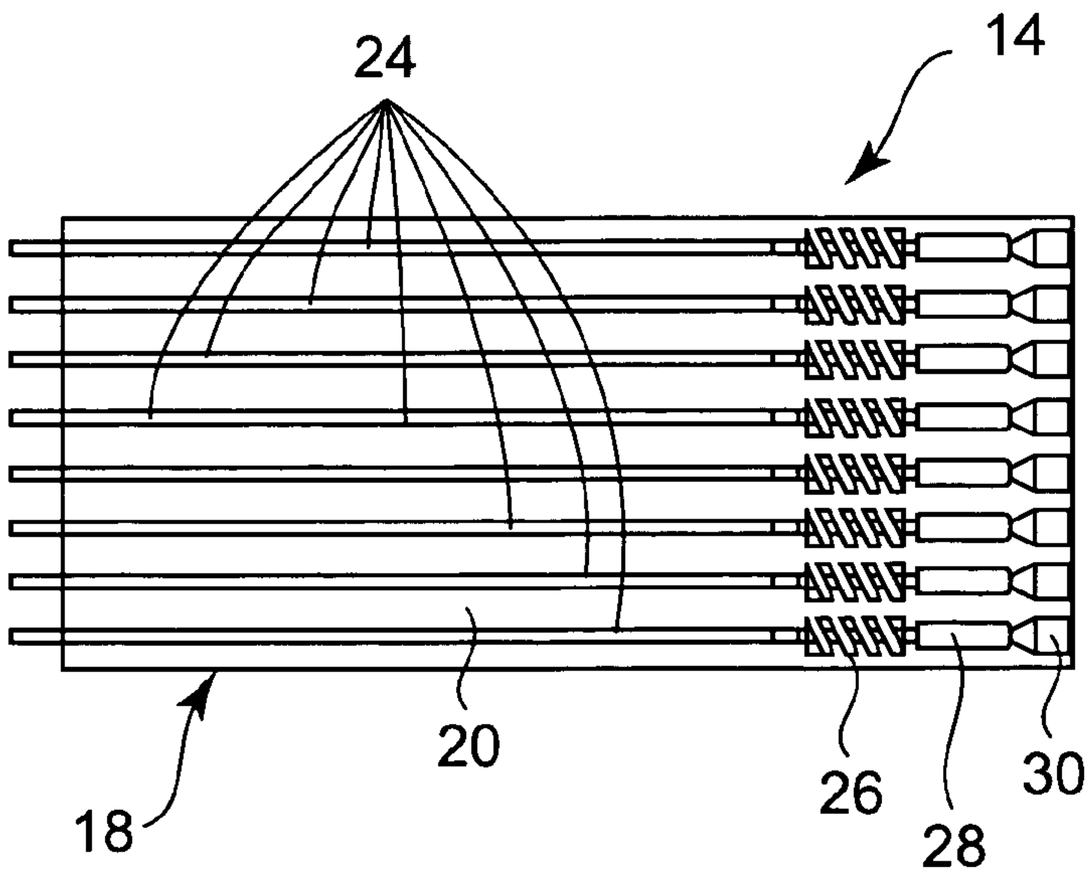


FIG. 4

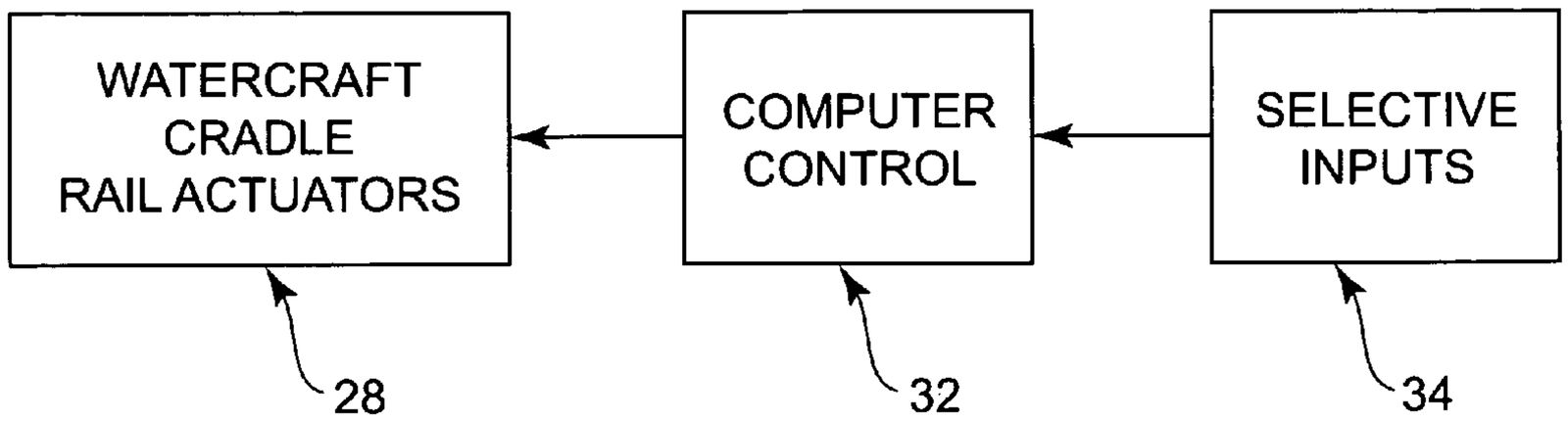

WATERCRAFT CRADLE RAIL ACTUATORS
COMPUTER CONTROL
SELECTIVE INPUTS
28
32
34

FIG. 5

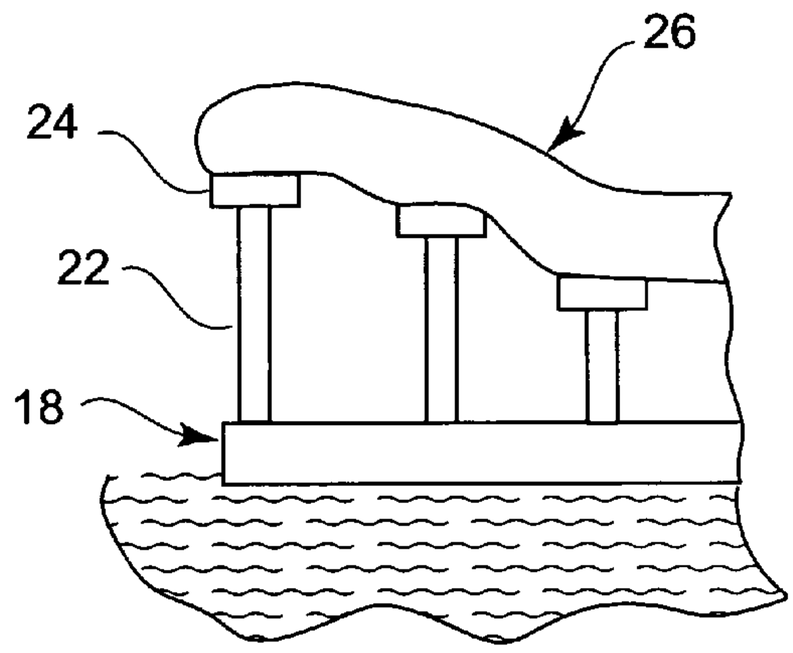

26
24
22
18

FIG. 6

WATERCRAFT LANDING CRADLE

STATEMENT OF GOVERNMENT INTEREST

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefore.

The present invention relates to landing reception of watercraft on the stern ramp of sea vessels.

BACKGROUND OF THE INVENTION

Watercraft are currently retrieved from a body of seawater onto a retrieval ship, involving use of a ramp projected from the stern of the ship onto which the watercraft is landed. Such ramp landing of watercraft often effects impact damage thereof because of hydrodynamic turbulence and ship motion, imposing displacement of the watercraft on the ramp. It is therefore an important object of the present invention to avoid the foregoing watercraft damage imposing problems during retrieval of watercraft onto ships.

SUMMARY OF THE INVENTION

Pursuant to the present invention a rectangular ramp frame attached to the stern of a ship is provided with a plurality of parallel spaced horizontally elongated rails onto which a watercraft is landed and retained during retrieval onto the ship. Such rails are maintained in horizontal positions vertically spaced above the ramp frame by adjusted amounts in a parallelgram arrangement of linkages so that the vertical positions of the rails may be selectively varied to accommodate watercraft with different hull shape cross-sections. Such rail adjustment is effected through actuators pivotally interconnecting the rails with one end of the frame, under selective computer control. Watercraft are accordingly received on rails adjusted to match their hull shape for retention on the ramp frame with vibration due to sea condition reduced. Further vibration reduction is effected, by shock-absorbing springs in engagement with the rails at the ends thereof to which the actuators are connected.

BRIEF DESCRIPTION OF DRAWING

A more complete appreciation of the invention and many of its attendant advantages will be readily appreciated as the same becomes better understood by reference to the following detailed description when considered in connection with the accompanying drawing wherein:

FIG. **1** is a side elevation view of a watercraft landed onto a floating ramp cradle attached to the stern of a retrieval ship;

FIG. **2** is a partial section view taken substantially through a plane indicated by section line **2—2** in FIG. **1**;

FIG. **3** is a front elevation view of the floating ramp cradle with all landing rails horizontally aligned in their topmost positions;

FIG. **4** is a top elevation view of the ramp cradle as seen from section line **4—4** is in FIG. **3**;

FIG. **5** is a diagram of the rail adjustment system associated with the ramp cradle shown in FIGS. **1–4**; and

FIG. **6** is a partial front elevation view corresponding to that of FIG. **3**, showing the rails in adjusted positions with an inflated shock-absorbing cover thereon.

DETAILED DESCRIPTION OF PREFERRED EMBODIMENT

Referring now to the drawing in detail, FIG. **1** illustrates a body of seawater **10** underlying a ship **12** floating thereon having a stern end **13** to which a cradle ramp **14** is attached for landing or reception thereon of a watercraft **16**, such as a small boat or unmanned sea vehicle. The watercraft **16** received on the cradle ramp **14** from a location on the surface of the seawater **10** or from a location submerged therein may be transferred from the ramp cradle **14** onto the stern of the ship **12** as generally known in the art. However pursuant to the present invention, the cradle ramp **14** is selectively adjusted in configuration prior to reception of the watercraft **16** thereon to avoid damaging thereof during reception and retrieval onto the ship **12** from its seawater location.

As shown in FIGS. **1–4**, the cradle ramp **14** includes a bottom floating frame **18** having a top rectangular support surface **20**, with a plurality of parallelgram linkages **22** pivotally interconnected between rails **24** and at spaced locations on the frame **18** for horizontally positioning of a plurality (8 to 10) of the rails **24**, disposed in parallel spaced relation to each other as shown in FIGS. **3** and **4**. One end of each of the rails **24** projects beyond the top frame surface **20**, while the other rail end is connected to an actuator **28** pivotally connected to the end of the frame **18** by a pivot anchor **30**. Such actuators **28** extend through shock-absorbing coil springs **26** in abutment with the ends of the rails **24** opposite the other ends projecting beyond the frame **18**. Thus, each of the rails **24** is displaced horizontally by its actuator **28** so as to effect pivotal displacement of the linkages **22** extending therefrom to the bottom frame **18**, so as to effect vertical displacement of the rails **24** by different amounts between lower and higher horizontal positions as shown in FIG. **2**, corresponding to the hull shape of the watercraft **16** received thereon.

Accordingly, vertical positioning of the rails **24** is selectively varied from their horizontally aligned top positions as shown in FIG. **3** in order to conform to the hull shape of the watercraft **16**, which is generally cylindrical as shown in FIG. **2**. Other differently shaped watercraft hulls, such as V-shaped hulls, may also be accommodated by positional adjustment of the rails **24** through the rail actuators **28** under computer control **32** as diagrammed in FIG. **5**. In response to selective inputs **34**, differently shaped watercraft hulls may thereby be landed on the cradle ramp **14** with minimized impact after controlled adjustment of the rails **24**, while impact induced vibrations because of sea conditions are thereafter reduced by the shock-absorbing springs **26**.

According to other embodiments of the present invention, an inflatable cover **36** may be placed onto the adjusted rails **24** as shown in FIG. **6**, before landing of a watercraft thereon.

Obviously, other modifications and variations of the present invention may be possible in light of the foregoing teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

What is claimed is:

1. A cradle on which a water craft is landed, comprising: a seawater floating frame; a plurality of elongated rails on which the landed watercraft is positioned above the frame; linkage means operatively interconnecting the frame with the rails for movement thereof to adjusted positions differently spaced from the frame; actuator means connected to the rails for selectively imparting said movement thereto to

said adjusted positions corresponding to cross-sectional hull shape of the watercraft prior to landing of the watercraft on the cradle; and spring means engaged with the rails and the actuator means for shock-absorption of vibrations imparted to the watercraft during retention on the rails after being landed thereon.

2. In combination with a retrieval ship having a stern, a cradle ramp connected to the stern on which a watercraft is landed, comprising: a frame; a plurality of elongated rails; linkage means operatively interconnecting the frame with

the rails for movement thereof between positions differently spaced from the frame; actuator means connected to the rails for selectively imparting said movement thereto to said positions adjusted to correspond to cross-sectional hull shape of the watercraft; and spring means engaged with the rails and the actuator means for shock-absorption of vibrations imparted to the watercraft during retention on the rails after being landed thereon.

* * * * *